What is claimed is:

1. A method for sectioning an input image into a plurality of regions, the method comprising the steps of:

(a) converting each pixel of the input image into color coordinates in an arbitrary color space including a luminance (L) axis;

(b) partitioning the color space into a plurality of layers along the luminance (L) axis and partitioning each of the plurality of layers into a plurality of bins along color (α and β) axes;

(c) obtaining an upper last circle by a mean-shift analysis, the upper last circle encircling the largest number of pixels having features most similar to those of a base pixel located at a predetermined position within a bin having the largest number of pixels in the color space among bins included in an upper layer;

(d) obtaining a lower last circle by the mean-shift analysis, the lower last circle including the largest number of pixels having features most similar to those of a base pixel located at the same position as the center of the upper last circle in a lower layer adjacent to the upper layer;

(e) including the upper last and lower last circles in the same cluster if a distance between the centers of the upper last and lower last circles is less than a first threshold value, and if another lower layer adjacent to the lower layer exists, determining the lower layer and the adjacent lower layer as a new upper layer and a new lower layer, respectively, and returning to step (d);

(f) if the distance between the centers of the upper last and lower last circles is no less than the first threshold value or if the adjacent lower layer does not exist, partitioning the cluster using a last circle including the smallest number of pixels in the color space used in calculating an average color, an average texture, and an average position among the last circles included in the cluster; and

(g) performing steps (c) - (f) on the remaining pixels not included in the upper last or the lower last circle and generating an image graph using clusters obtained for all pixels in the color space.

2. The method of claim 1, further comprising the steps of smoothing the input image a predetermined number times before step (a),

wherein an arbitrary color space including the luminance (L) axis is an Lαβ color space, and in step (a), each pixel in the smoothed image is converted into color coordinates in the Lαβ color space.

3. The method of claim 2, after step (g), further comprising the step of comparing a color-texture distance with a second threshold value and merging regions marked in the image graph according to the comparison result to obtain a final image graph.

4. The method of claim 3, wherein step (c) comprises the steps of:

(c1) among pixels included in an upper arbitrary circle centered on the predetermined position, selecting only pixels whose texture feature values are less than a texture feature value of a pixel located at the center of the upper arbitrary circle and which are spaced apart less than a predetermined distance from the position of the pixel located at the center of the upper arbitrary circle on an image plane, and obtaining the average color, the average texture, and the average position on the image plane for the selected pixels;

(c2) determining whether a spacing degree obtained from differences between the averages and feature values of the base pixel at the center of the upper arbitrary circle is less than or equal to a first predetermined value in the Lαβ color space;

(c3) designating a pixel located at the position corresponding to the calculated average color as an imaginary base pixel if the spacing degree is greater than the first predetermined value, designating a texture feature value and a position on the image plane of the imaginary base pixel as the average texture and the average position on the image plane calculated in step (c1), determining a new upper arbitrary circle centered on the designated imaginary base pixel, and returning to step (c1); and

(c4) determining the upper arbitrary circle as the upper last circle if the spacing degree is less than or equal to the first predetermined value and proceeding with step (d).

5. The method of claim 4, wherein step (d) comprises steps of:

(d1) among pixels included in a lower arbitrary circle having its center at the same position as the center of the upper last circle in the lower layer, selecting only pixels whose texture feature values are less than a texture feature value of a base pixel located at the same position as the center of the upper last circle and which are spaced apart less than a predetermined distance from a position of the base pixel on the image plane, and obtaining an average color, an average texture, and an average position on the image plane for the selected pixels;

(d2) determining whether a spacing degree obtained from differences between the averages calculated in the step (d1) and feature values of the base pixel at the center of the lower arbitrary circle is less than or equal to the first predetermined value in the $L\alpha\beta$ color space;

(d3) designating a pixel located at a position corresponding to the average color calculated in the step (d1) as an imaginary base pixel if the spacing degree of step (d2) is greater than the first predetermined value, designating the texture feature value and a position on the image plane of the imaginary base pixel as the average texture and the average position on

the image plane calculated in the step (d1), determining a new lower arbitrary circle centered on the designated imaginary base pixel, and returning to the step (d1); and

(d4) determining the lower arbitrary circle as the lower last circle if the spacing degree of step (d2) is less than or equal to the first predetermined value and proceeding with step (e).

6. The method of claim 4, wherein, in step (c1), if a distance Δ' between any pixel located in the upper arbitrary circle and a pixel located at the center of the upper arbitrary circle is less than a second predetermined value, an average color, a average texture, and an average position on an image plane for any pixel in the upper arbitrary circle are reflected when calculating the averages, and

wherein the distance Δ' between the pixels is calculated according to the following equation:

$$\Delta' = \frac{\Delta X^2 + \Delta Y^2}{\sigma_G^2} + \frac{\Delta\alpha^2 + \Delta\beta^2}{\sigma_C^2} + \sum_{i'=1}^{K} \frac{\sum_{j'=1}^{Z} \Delta\theta_{i'j'}^2}{\sigma_{\theta_{i'}}^2}$$

where X and Y are positions on the image plane for each of the pixels, α and β are color components in the color space, θ denotes a texture response, and σ_G, σ_C and σ_θ are the predetermined distance by which the pixels are spaced apart from the position of the base pixel, a radius of the upper arbitrary circle, and a texture distance representing the extent to which the texture feature value of the pixel is less than that of the base pixel, respectively.

7. The method of claim 5, wherein, in step (d1), if a distance Δ' between any pixel located in the lower arbitrary circle and a pixel located at

the center of the lower arbitrary circle is less than a second predetermined value, an average color, an average texture, and an average position on an image plane for any pixel in the lower arbitrary circle are reflected in calculating the averages, and

wherein the distance Δ' between the pixels is calculated according to the following equation:

$$\Delta' = \frac{\Delta X^2 + \Delta Y^2}{\sigma_G^2} + \frac{\Delta\alpha^2 + \Delta\beta^2}{\sigma_C^2} + \sum_{i'=1}^{K} \frac{\sum_{j'=1}^{Z} \Delta\theta_{i'j'}^2}{\sigma_{\theta_{i'}}^2}$$

where X and Y are positions on the image plane for each of the pixels, α and β are color components in the color space, θ denotes a texture response, and σ_G, σ_C and σ_θ are the predetermined distance by which the pixels are spaced apart from the position of the base pixel on the image plane, a radius of the lower arbitrary circle, and a texture distance representing the extent to which the texture feature value of the pixel is less than that of the base pixel, respectively.

8. The method of claim 1, wherein the upper layer has a brightness level higher than a brightness level of the lower layer.

9. The method of claim 1, wherein the upper layer has a brightness level lower than a brightness level of the lower layer.

10. An apparatus for sectioning the input image into the plurality of regions, comprising:

an image preprocessor that smooths the input image a predetermined number of times, enhances edges in the smoothed image, and outputs a preprocessed image;

a feature value calculator that calculates color feature values and texture feature values from the image output from the image preprocessor on a pixel-by-pixel basis and outputs the calculated result;

a main region section unit that generates an image graph from clusters obtained by using color, texture, and position on the image plane for each pixel in the image output from the image preprocessor and the color and texture feature values output from the feature value calculator and outputs the generated image graph; and

an image graph simplification unit that compares a color-texture distance calculated using the color feature values and the texture feature values output from the feature value calculator with a second threshold value, simplifies the image graph according to the comparison result, and outputs a final image graph obtained from the simplified image graph.